```
CP/M MACRO ASSEM 2.0    #001    ASM OPERAND SCAN MODULE

                        TITLE   'ASM OPERAND SCAN MODULE'
                ;       OPERAND SCAN MODULE
 1860                   ORG     1860H
                ;
                ;       EXTERNALS
 0200 =         IOMOD   EQU     200H    ;I/O MODULE
 1100 =         SCMOD   EQU     1100H   ;SCANNER MODULE
 1340 =         SYMOD   EQU     1340H   ;SYMBOL TABLE MODULE
 15A0 =         BMOD    EQU     15A0H   ;BINARY SEARCH MODULE
                ;
                ;
 0218 =         PERR    EQU     IOMOD+18H
 1106 =         SCAN    EQU     SCMOD+6H        ;SCANNER ENTRY POINT
 000D =         CR      EQU     0DH     ;CARRIAGE RETURN
                ;
 1346 =         LOOKUP  EQU     SYMOD+6H        ;LOOKUP
 1349 =         FOUND   EQU     LOOKUP+3        ;FOUND SYMBOL IF ZERO FLAG NOT SET
 134C =         ENTER   EQU     FOUND+3         ;ENTER SYMBOL
 134F =         SETTY   EQU     ENTER+3         ;SET TYPE FIELD
 1352 =         GETTY   EQU     SETTY+3         ;SET TYPE FIELD
 1355 =         SETVAL  EQU     GETTY+3         ;SET VALUE FIELD
 1358 =         GETVAL  EQU     SETVAL+3        ;GET VALUE FIELD
                ;
 15A3 =         BSEAR   EQU     BMOD+3  ;BINARY SEARCH ROUTINE
 15A6 =         BGET    EQU     BSEAR+3 ;GET VALUES WITH SEARCH
                ;
                ;       COMMON EQUATES
 0078 =         PBMAX   EQU     120     ;MAX PRINT SIZE
 010C =         PBUFF   EQU     10CH    ;PRINT BUFFER
 0184 =         PBP     EQU     PBUFF+PBMAX     ;PRINT BUFFER POINTER
                ;
 0185 =         TOKEN   EQU     PBP+1   ;CURRENT TOKEN UDER SCAN
 0186 =         VALUE   EQU     TOKEN+1 ;VALUE OF NUMBER IN BINARY
 0188 =         ACCLEN  EQU     VALUE+2 ;ACCUMULATOR LENGTH
 0040 =         ACMAX   EQU     64      ;MAX ACCUMULATOR LENGTH
 0189 =         ACCUM   EQU     ACCLEN+1
                ;
 01C9 =         EVALUE  EQU     ACCUM+ACMAX     ;VALUE FROM EXPRESSION ANALYSIS
                ;
 01CB =         SYTOP   EQU     EVALUE+2        ;CURRENT SYMBOL TOP
 01CD =         SYMAX   EQU     SYTOP+2         ;MAX ADDRESS+1
                ;
 01CF =         PASS    EQU     SYMAX+2 ;CURRENT PASS NUMBER
 01D0 =         FPC     EQU     PASS+1  ;FILL ADDRESS FOR NEXT HEX BYTE
 01D2 =         ASPC    EQU     FPC+2   ;ASSEMBLER'S PSEUDO PC
                ;
                ;       GLOBAL EQUATES
 0001 =         IDEN    EQU     1       ;IDENTIFIER
 0002 =         NUMB    EQU     2       ;NUMBER
 0003 =         STRNG   EQU     3       ;STRING
 0004 =         SPECL   EQU     4       ;SPECIAL CHARACTER
                ;
 0001 =         PLABT   EQU     0001B   ;PROGRAM LABEL
 0002 =         DLABT   EQU     0010B   ;DATA LABEL
 0004 =         EQUT    EQU     0100B   ;EQUATE
 0005 =         SETT    EQU     0101B   ;SET
```

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CP/M MACRO ASSEM 2.0    #002    ASM OPERAND SCAN MODULE

 0006 =          MACT    EQU     0110B   ;MACRO
                 ;
 0008 =          EXTT    EQU     1000B   ;EXTERNAL
 000B =          REFT    EQU     1011B   ;REFER
 000C =          GLBT    EQU     1100B   ;GLOBAL
                 ;
                 ;
                 ;       TABLE DEFINITIONS
 0000 =          XBASE   EQU     0       ;START OF OPERATORS
 000F =          OPER    EQU     15      ;LAST OPERATOR
 0010 =          RT      EQU     16
 0011 =          PT      EQU     RT+1    ;RT IS REGISTER TYPE, PT IS PSEUDO OPERATION
 0012 =          OBASE   EQU     PT+1
                 ;
 0005 =          PLUS    EQU     5
 0006 =          MINUS   EQU     6
 0008 =          NOTF    EQU     8       ;NOT
 000C =          LPAR    EQU     12
 000D =          RPAR    EQU     13
 000A =          OSMAX   EQU     10
 0010 =          VSMAX   EQU     8*2
                 ;
                 ;
                 ;       BEGINNING OF MODULE
 1860 C3A01B             JMP     ENDMOD  ;PAST THIS MODULE
 1863 C3191A             JMP     OPAND   ;SCAN OPERAND FIELD
 1866 C36E19             JMP     MULF    ;MULTIPLY FUNCTION
 1869 C33819             JMP     DIVE    ;DIVIDE FUNCTION
 186C            UNARY:  DS      1       ;TRUE IF NEXT OPERATOR IS UNARY
 186D            OPERV:  DS      OSMAX   ;OPERATOR STACK
 1877            HIERV:  DS      OSMAX   ;OPERATOR PRIORITY
 1881            VSTACK: DS      VSMAX   ;VALUE STACK
 1891            OSP:    DS      1       ;OPERATOR STACK POINTER
 1892            VSP:    DS      1       ;VALUE STACK POINTER
                 ;
                 ;
                 ;
                 STKV:   ;PLACE CURRENT H,L VALUE AT TOP OF VSTACK
 1893 EB                 XCHG    ;HOLD VALUE IN D,E
 1894 219218             LXI     H,VSP
 1897 7E                 MOV     A,M
 1898 FE10               CPI     VSMAX
 189A DAA218             JC      STKV0
 189D CD851B             CALL    ERREX   ;OVERFLOW IN EXPRESSION
 18A0 3600               MVI     M,0     ;VSP=0
 18A2 7E         STKV0:  MOV     A,M     ;GET VSP
 18A3 34                 INR     M       ;VSP=VSP+1
 18A4 34                 INR     M       ;VSP=VSP+2
 18A5 4F                 MOV     C,A     ;SAVE VSP
 18A6 0600               MVI     B,0     ;DOUBLE VSP
 18A8 218118             LXI     H,VSTACK
 18AB 09                 DAD     B
 18AC 73                 MOV     M,E     ;LOW BYTE
 18AD 23                 INX     H
 18AE 72                 MOV     M,D     ;HIGH BYTE
 18AF C9                 RET
```

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```
                ;
                STKO:   ;STACK OPERATOR (REG-A) AND PRIORITY (REG-B)
18B0 F5                 PUSH    PSW     ;SAVE IT
18B1 219118             LXI     H,OSP
18B4 7E                 MOV     A,M
18B5 FE0A               CPI     OSMAX
18B7 DABF18             JC      STKO1
18BA 3600               MVI     M,0
18BC CD851B             CALL    ERREX   ;OPERATOR STACK OVERFLOW
18BF 5E         STKO1:  MOV     E,M     ;GET OSP
18C0 1600               MVI     D,0
18C2 34                 INR     M       ;OSP=OSP+1
18C3 F1                 POP     PSW     ;RECALL OPERATOR
18C4 216D18             LXI     H,OPERV
18C7 19                 DAD     D       ;OPERV(OSP)
18C8 77                 MOV     M,A     ;OPERV(OSP)=OPERATOR
18C9 217718             LXI     H,HIERV
18CC 19                 DAD     D
18CD 70                 MOV     M,B     ;HIERV(OSP)=PRIORITY
18CE C9                 RET
                ;
                LODV1:  ;LOAD TOP ELEMENT FROM VSTACK TO H,L
18CF 219218             LXI     H,VSP
18D2 7E                 MOV     A,M
18D3 B7                 ORA     A
18D4 C2DE18             JNZ     LODOK
18D7 CD851B             CALL    ERREX   ;UNDERFLOW
18DA 210000             LXI     H,0
18DD C9                 RET
                ;
18DE 35         LODOK:  DCR     M
18DF 35                 DCR     M       ;VSP=VSP-2
18E0 4E                 MOV     C,M     ;LOW BYTE
18E1 0600               MVI     B,0
18E3 218118             LXI     H,VSTACK
18E6 09                 DAD     B       ;VSTACK(VSP)
18E7 4E                 MOV     C,M     ;GET LOW BYTE
18E8 23                 INX     H
18E9 66                 MOV     H,M
18EA 69                 MOV     L,C
18EB C9                 RET
                ;
                LODV2:  ;LOAD TOP TWO ELEMENTS DE HOLDS TOP, HL HOLDS TOP-1
18EC CDCF18             CALL    LODV1
18EF EB                 XCHG
18F0 CDCF18             CALL    LODV1
18F3 C9                 RET
                ;
                APPLY:  ;APPLY OPERATOR IN REG-A TO TOP OF STACK
18F4 6F                 MOV     L,A
18F5 2600               MVI     H,0
18F7 29                 DAD     H       ;OPERATOR NUMBER*2
18F8 110119             LXI     D,OPTAB
18FB 19                 DAD     D       ;INDEXED OPTAB
18FC 5E                 MOV     E,M     ;LOW ADDRESS
18FD 23                 INX     H
```

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```
18FE 66                 MOV     H,M     ;HIGH ADDRESS
18FF 6B                 MOV     L,E
1900 E9                 PCHL            ;SET PC AND GO TO SUBROUTINE
                ;
1901 8919       OPTAB:  DW      MULOP
1903 9219               DW      DIVOP
1905 9919               DW      MODOP
1907 9F19               DW      SHLOP
1909 AB19               DW      SHROP
190B BF19               DW      ADDOP
190D C619               DW      SUBOP
190F D019               DW      NEGOP
1911 D919               DW      NOTOP
1913 E019               DW      ANDOP
1915 EC19               DW      OROP
1917 F819               DW      XOROP
1919 851B               DW      ERREX   ;(
                ;
                ;       SPECIFIC HANDLERS FOLLOW
                SHFT:   ;SET UP OPERANDS FOR SHIFT L AND R
191B CDEC18             CALL    LODV2
191E 7A                 MOV     A,D     ;ENSURE 0-15
191F B7                 ORA     A
1920 C22719             JNZ     SHERR
1923 7B                 MOV     A,E
1924 FE11               CPI     17
1926 D8                 RC              ;RETURN IF 0-16 SHIFT
1927 CD851B     SHERR:  CALL    ERREX
192A 3E10               MVI     A,16
192C C9                 RET
                ;
                NEGF:   ;COMPUTE 0-H,L TO H,L
192D AF                 XRA     A
192E 95                 SUB     L
192F 6F                 MOV     L,A
1930 3E00               MVI     A,0
1932 9C                 SBB     H
1933 67                 MOV     H,A
1934 C9                 RET
                ;
1935 CDEC18     DIVF:   CALL    LODV2
                DIVE:   ;(EXTERNAL ENTRY FROM MAIN PROGRAM)
1938 EB                 XCHG            ;SWAP D,E WITH H,L FOR DIVIDE FUNCTION
                ;       COMPUTE X/Y WHERE X IS IN D,E AND Y IS IN H,L
                ;       THE VALUE OF X/Y APPEARS IN D,E AND X MOD Y IS IN H,L
                ;
1939 226B19             SHLD    DTEMP   ;SAVE X IN TEMPORARY
193C 216D19             LXI     H,BNUM  ;STORE BIT COUNT
193F 3611               MVI     M,11H
1941 010000             LXI     B,0     ;INTIALIZE RESULT
1944 C5                 PUSH    B
1945 AF                 XRA     A       ;CLEAR FLAGS
                DLOOP:
1946 7B                 MOV     A,E     ;GET LOW Y BYTE
1947 17                 RAL
1948 5F                 MOV     E,A
```

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```
1949 7A              MOV     A,D
194A 17              RAL
194B 57              MOV     D,A
194C 35              DCR     M       ;DECREMENT BIT COUNT
194D E1              POP     H       ;RESTORE TEMP RESULT
194E C8              RZ              ;ZERO BIT COUNT MEANS ALL DONE
194F 3E00            MVI     A,0     ;ADD IN CARRY
1951 CE00            ACI     0       ;CARRY
1953 29              DAD     H       ;SHIFT TEMP RESULT LEFT ONE BIT
1954 44              MOV     B,H     ;COPY HA AND L TO A A ND C
1955 85              ADD     L
1956 2A6B19          LHLD    DTEMP   ;GET ADDRESS OF X
1959 95              SUB     L       ;SUBTRACT FROM TEMPORARY RESULT
195A 4F              MOV     C,A
195B 78              MOV     A,B
195C 9C              SBB     H
195D 47              MOV     B,A
195E C5              PUSH    B       ;SAVE TEMP RESULT IN STACK
195F D26419          JNC     DSKIP   ;NO BORROW FROM SUBTRACT
1962 09              DAD     B       ;ADD X BACK IN
1963 E3              XTHL    ;REPLACE TEMP RESULT ON STACK
1964 216D19  DSKIP:  LXI     H,BNUM  ;RESTORE H,L
1967 3F              CMC
1968 C34619          JMP     DLOOP   ;REPEAT LOOP STEPS
                     ;
196B         DTEMP:  DS      2
196D         BNUM:   DS      1
                     ;
                     MULF:   ;MULTIPLY D,E BY H,L AND REPLACE H,L WITH RESULT
196E 44              MOV     B,H
196F 4D              MOV     C,L     ;COPY OF 1ST VALUE TO B,C FOR SHIFT AND ADD
1970 210000          LXI     H,0     ;H,L IS THE ACCUMULATOR
1973 AF      MUL0:   XRA     A
1974 78              MOV     A,B     ;CARRY IS CLEARED
1975 1F              RAR
1976 47              MOV     B,A
1977 79              MOV     A,C
1978 1F              RAR
1979 4F              MOV     C,A
197A DA8219          JC      MUL1    ;SKIP THIS ADD IF LSB IS ZERO
197D B0              ORA     B
197E C8              RZ              ;RETURN WITH H,L
197F C38319          JMP     MUL2    ;SKIP ADD
1982 19      MUL1:   DAD     D       ;ADD CURRENT VALUE OF D
1983 EB      MUL2:   XCHG    ;READY FOR *2
1984 29              DAD     H
1985 EB              XCHG
1986 C37319          JMP     MUL0
                     ;
                     MULOP:  ;MULTIPLY D,E BY H,L
1989 CDEC18          CALL    LODV2
198C CD6E19          CALL    MULF
198F C3011A          JMP     ENDOP
                     ;
                     DIVOP:  ;DIVIDE H,L BY D,E
1992 CD3519          CALL    DIVF
```

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```
1995 EB              XCHG            ;RESULT TO H,L
1996 C3011A          JMP     ENDOP
                ;
1999 CD3519     MODOP:  CALL    DIVF
199C C3011A          JMP     ENDOP
                ;
199F CD1B19     SHLOP:  CALL    SHFT    ;CHECK VALUES
19A2 B7         SHL0:   ORA     A       ;DONE?
19A3 CA011A          JZ      ENDOP
19A6 29              DAD     H       ;HL=HL*2
19A7 3D              DCR     A
19A8 C3A219          JMP     SHL0
                ;
19AB CD1B19     SHROP:  CALL    SHFT
19AE B7         SHR0:   ORA     A       ;DONE?
19AF CA011A          JZ      ENDOP
19B2 F5              PUSH    PSW     ;SAVE CURRENT COUNT
19B3 AF              XRA     A
19B4 7C              MOV     A,H
19B5 1F              RAR
19B6 67              MOV     H,A
19B7 7D              MOV     A,L
19B8 1F              RAR
19B9 6F              MOV     L,A
19BA F1              POP     PSW
19BB 3D              DCR     A
19BC C3AE19          JMP     SHR0
                ;
19BF CDEC18     ADDOP:  CALL    LODV2
19C2 19         ADD0:   DAD     D
19C3 C3011A          JMP     ENDOP
                ;
19C6 CDEC18     SUBOP:  CALL    LODV2
19C9 EB              XCHG            ;TREAT AS HL+(-DE)
19CA CD2D19          CALL    NEGF    ;0-HL
19CD C3C219          JMP     ADD0
                ;
19D0 CDCF18     NEGOP:  CALL    LODV1
19D3 CD2D19     NEG0:   CALL    NEGF    ;COMPUTE 0-HL
19D6 C3011A          JMP     ENDOP
                ;
19D9 CDCF18     NOTOP:  CALL    LODV1
19DC 23              INX     H       ;65536-HL = 65535-(HL+1)
19DD C3D319          JMP     NEG0
                ;
19E0 CDEC18     ANDOP:  CALL    LODV2
19E3 7A              MOV     A,D
19E4 A4              ANA     H
19E5 67              MOV     H,A
19E6 7B              MOV     A,E
19E7 A5              ANA     L
19E8 6F              MOV     L,A
19E9 C3011A          JMP     ENDOP
                ;
19EC CDEC18     OROP:   CALL    LODV2
19EF 7A              MOV     A,D
```

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```
19F0 B4              ORA     H
19F1 67              MOV     H,A
19F2 7B              MOV     A,E
19F3 B5              ORA     L
19F4 6F              MOV     L,A
19F5 C3011A          JMP     ENDOP
                ;
19F8 CDEC18     XOROP:  CALL    LODV2
19FB 7A              MOV     A,D
19FC AC              XRA     H
19FD 67              MOV     H,A
19FE 7B              MOV     A,E
19FF AD              XRA     L
1A00 6F              MOV     L,A
                ;
1A01 C39318     ENDOP:  JMP     STKV
                ;
                ;
                ;
                ENDEXP: ;RETURNS ZERO FLAG IF SYMBOL IS CR, ;, OR ,
1A04 3A8501          LDA     TOKEN
1A07 FE04            CPI     SPECL
1A09 C0              RNZ             ;NOT END IF NOT SPECIAL
                ;
1A0A 3A8901          LDA     ACCUM
1A0D FE0D            CPI     CR
1A0F C8              RZ
1A10 FE3B            CPI     ';'
1A12 C8              RZ
1A13 FE2C            CPI     ','
1A15 C8              RZ
1A16 FE21            CPI     '!'
1A18 C9              RET
                ;
                OPAND:  ;SCAN THE OPERAND FIELD OF AN INSTRUCTION
                ;       (NOT A DB WITH FIRST TOKEN STRING > 2 OR 0)
1A19 AF              XRA     A
1A1A 329118          STA     OSP     ;ZERO OPERATOR STACK POINTER
1A1D 329218          STA     VSP
1A20 3D              DCR     A       ;255
1A21 326C18          STA     UNARY
1A24 210000          LXI     H,0
1A27 22C901          SHLD    EVALUE
                ;
                OP0:    ;ARRIVE HERE WITH NEXT ITEM ALREADY SCANNED
1A2A CD041A          CALL    ENDEXP  ;DONE?
1A2D C25D1A          JNZ     OP1
                ;       EMPTY THE OPERATOR STACK
1A30 219118     EMPOP:  LXI     H,OSP
1A33 7E              MOV     A,M     ;GET THE OSP AND CHECK FOR EMPTY
1A34 B7              ORA     A
1A35 CA481A          JZ      CHKVAL  ;JUMP IF EMPTY
1A38 35              DCR     M       ;POP ELEMENT
1A39 5F              MOV     E,A     ;COPY FOR DOUBLE ADD
1A3A 1D              DCR     E
1A3B 1600            MVI     D,0
```

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```
CP/M MACRO ASSEM 2.0    #008    ASM OPERAND SCAN MODULE

 1A3D 216D18            LXI     H,OPERV
 1A40 19                DAD     D       ;INDEXED - OPERV(OSP)
 1A41 7E                MOV     A,M     ;GET OPERATOR
 1A42 CDF418            CALL    APPLY   ;APPLY OPERATOR
 1A45 C3301A            JMP     EMPOP
                ;
                CHKVAL:
 1A48 3A9218            LDA     VSP     ;MUST HAVE ONE ELEMENT IT THE STACK
 1A4B FE02              CPI     2
 1A4D C4851B            CNZ     ERREX
 1A50 3A0C01            LDA     PBUFF
 1A53 FE20              CPI     ' '
 1A55 C0                RNZ             ;EVALUE REMAINS AT ZERO
 1A56 2A8118            LHLD    VSTACK  ;GET DOUBLE BYTE IN STACK
 1A59 22C901            SHLD    EVALUE
 1A5C C9                RET
                ;
                OP1:    ;MORE TO SCAN
 1A5D 3A0C01            LDA     PBUFF
 1A60 FE20              CPI     ' '
 1A62 C27F1B            JNZ     GETOP
 1A65 3A8501            LDA     TOKEN
 1A68 FE03              CPI     STRNG   ;IS THIS A STRING?
 1A6A C2891A            JNZ     OP3
                ;
                ;       STRING - CONVERT TO DOUBLE PRECISION
 1A6D 3A8801            LDA     ACCLEN
 1A70 B7                ORA     A
 1A71 CC851B            CZ      ERREX   ;ERROR IF LENGTH=0
 1A74 FE03              CPI     3
 1A76 D4851B            CNC     ERREX   ;ERROR IF LENGTH>2
 1A79 1600              MVI     D,0
 1A7B 218901            LXI     H,ACCUM
 1A7E 5E                MOV     E,M     ;LSBYTE
 1A7F 23                INX     H
 1A80 3D                DCR     A       ;A HAS THE LENGTH
 1A81 CA851A            JZ      OP2     ;ONE OR TWO BYTES
 1A84 56                MOV     D,M     ;FILL HIGH ORDER
 1A85 EB        OP2:    XCHG            ;VALUE TO H,L
 1A86 C3711B            JMP     STNUM   ;STORE TO STACK
                ;
                OP3:    ;NOT A STRING, CHECK FOR NUMBER
 1A89 FE02              CPI     NUMB
 1A8B C2941A            JNZ     OP4
 1A8E 2A8601            LHLD    VALUE   ;NUMERIC VALUE
 1A91 C3711B            JMP     STNUM
                ;
                OP4:    ;NOT STRING OR NUMBER, MUST BE ID OR SPECL
 1A94 CDA615            CALL    BGET    ;BINARY SEARCH, GET ATTRIBUTES
 1A97 C2311B            JNZ     OP6     ;MATCH?
                ;       YES, MAY BE OPERATOR
 1A9A FE10              CPI     OPER+1
 1A9C D2261B            JNC     OP5
                ;       OPERATOR ENCOUNTERED MS NIBBLE OF B IS PRIORITY NUMBER LS NIBBLE
                ;       IS THE OPERATOR
                ;       ACC HAS THE OPERATOR NUMBER, B HAS PRIORITY
```

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CP/M MACRO ASSEM 2.0    #009    ASM OPERAND SCAN MODULE

 1A9F FE0C              CPI     LPAR    ;(?
 1AA1 4F                MOV     C,A     ;SAVE COPY OF OPERATOR NUMBER
 1AA2 3A6C18            LDA     UNARY
 1AA5 C2B51A            JNZ     OPER1   ;JUMP IF NOT A (
                ;       ( ENCOUNTERED, UNARY MUST BE TRUE
 1AA8 B7                ORA     A
 1AA9 CC851B            CZ      ERREX
 1AAC 3EFF              MVI     A,0FFH
 1AAE 326C18            STA     UNARY   ;UNARY IS SET TRUE
 1AB1 79                MOV     A,C     ;RECOVER OPERATOR
 1AB2 C3031B            JMP     OPER4   ;CALLS STKO AND SETS UNARY TO TRUE
                ;
                ;
                OPER1:  ;NOT A LEFT PAREN
 1AB5 B7                ORA     A
 1AB6 C20E1B            JNZ     OPER6   ;MUST BE + OR - SINCE UNARY IS SET
                ;
                ;       UNARY NOT SET, MUST BE BINARY OPERATOR
                OPER2:  ;COMPARE HIERARCHY OF TOS
 1AB9 C5                PUSH    B       ;SAVE PRIORITY AND OPERATOR NUMBER
 1ABA 3A9118            LDA     OSP
 1ABD B7                ORA     A
 1ABE CADE1A            JZ      OPER3   ;NO MORE OPERATORS IN STACK
 1AC1 5F                MOV     E,A     ;OSP TO E
 1AC2 1D                DCR     E       ;OSP-1
 1AC3 1600              MVI     D,0
 1AC5 217718            LXI     H,HIERV
 1AC8 19                DAD     D       ;HL ADDRESSES TOP OF OPERATOR STACK
 1AC9 7E                MOV     A,M     ;PRIORITY OF TOP OPERATOR
 1ACA B8                CMP     B       ;CURRENT GREATER?
 1ACB DADE1A            JC      OPER3   ;JUMP IF SO
                ;       APPLY TOP OPERATOR TO VALUE STACK
 1ACE 219118            LXI     H,OSP
 1AD1 73                MOV     M,E     ;OSP=OSP-1
 1AD2 216D18            LXI     H,OPERV
 1AD5 19                DAD     D
 1AD6 7E                MOV     A,M     ;OPERATOR NUMBER TO ACC
 1AD7 CDF418            CALL    APPLY
 1ADA C1                POP     B       ;RESTORE OPERATOR NUMBER AND PRIORITY
 1ADB C3B91A            JMP     OPER2   ;FOR ANOTHER TEST
                ;
                OPER3:  ;ARRIVE HERE WHEN OPERATOR IS STACKED
                ;       CHECK FOR RIGHT PAREN BALANCE
 1ADE C1                POP     B       ;OPERATOR NUMBER IN C, PRIORITY IN B
 1ADF 79                MOV     A,C
 1AE0 FE0D              CPI     RPAR
 1AE2 C2031B            JNZ     OPER4   ;JUMP IF NOT A RIGHT PAREN
                ;
                ;       RIGHT PAREN FOUND, STACK MUST CONTAIN LEFT PAREN TO DELETE
 1AE5 219118            LXI     H,OSP
 1AE8 7E                MOV     A,M
 1AE9 B7                ORA     A       ;ZERO?
 1AEA CAFC1A            JZ      LPERR   ;PAREN ERROR IF SO
 1AED 3D                DCR     A       ;OSP-1
 1AEE 77                MOV     M,A     ;STORED TO MEMORY
 1AEF 5F                MOV     E,A
```

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1AF0 1600              MVI     D,0
1AF2 216D18            LXI     H,OPERV
1AF5 19                DAD     D
1AF6 7E                MOV     A,M     ;TOP OPERATOR IN REG-A
1AF7 FE0C              CPI     LPAR
1AF9 CAFF1A            JZ      NLERR   ;JMP IF NO ERROR - PARENS BALANCE
1AFC CD851B    LPERR:  CALL    ERREX
               NLERR:  ;ERROR REPORTING COMPLETE
1AFF AF                XRA     A
1B00 C3081B            JMP     OPER5   ;TO CLEAR UNARY FLAG
               ;
               OPER4:  ;ORDINARY OPERATOR
1B03 CDB018            CALL    STKO
1B06 3EFF              MVI     A,0FFH  ;TO SET UNARY FLAG
1B08 326C18    OPER5:  STA     UNARY
1B0B C37F1B            JMP     GETOP   ;FOR ANOTHER ELEMENT
               ;
               OPER6:  ;UNARY SET, MUST BE + OR -
1B0E 79                MOV     A,C     ;RECALL OPERATOR
1B0F FE05              CPI     PLUS
1B11 CA7F1B            JZ      GETOP   ;IGNORE UNARY PLUS
1B14 FE06              CPI     MINUS
1B16 C21E1B            JNZ     CHKNOT
1B19 3C                INR     A       ;CHANGE TO UNARY MINUS
1B1A 4F                MOV     C,A
1B1B C3B91A            JMP     OPER2
               CHKNOT: ;UNARY NOT SYMBOL?
1B1E FE08              CPI     NOTF
1B20 C4851B            CNZ     ERREX
1B23 C3B91A            JMP     OPER2
               ;
               ;
               OP5:    ;ELEMENT FOUND IN TABLE, NOT AN OPERATOR
1B26 FE11              CPI     PT      ;PSEUDO OPERATOR?
1B28 CC851B            CZ      ERREX   ;ERROR IF SO
1B2B 68                MOV     L,B     ;GET LOW VALUE TO L
1B2C 2600              MVI     H,0     ;ZERO HIGH ORDER BYTE
1B2E C3711B            JMP     STNUM   ;STORE IT
               ;
               OP6:    ;NOT FOUND IN TABLE SCAN, $?
1B31 3A8501            LDA     TOKEN
1B34 FE04              CPI     SPECL
1B36 C2501B            JNZ     OP7
1B39 3A8901            LDA     ACCUM
1B3C FE24              CPI     '$'
1B3E CA4A1B            JZ      CURPC   ;USE CURRENT PC
1B41 CD851B            CALL    ERREX
1B44 210000            LXI     H,0
1B47 C3711B            JMP     STNUM
1B4A 2AD201    CURPC:  LHLD    ASPC    ;GET CURRENT PC
1B4D C3711B            JMP     STNUM
               ;
               OP7:    ;NOT $, LOOK IT UP
1B50 CD4613            CALL    LOOKUP
1B53 CD4913            CALL    FOUND
1B56 C2641B            JNZ     FIDENT
```

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```
                ;       NOT FOUND IN SYMBOL TABLE, ENTER IF PASS 1
1B59 3E50               MVI     A,'P'
1B5B CD1802             CALL    PERR
1B5E CD4C13             CALL    ENTER   ;ENTER SYMBOL WITH ZERO TYPE FIELD
1B61 C36E1B             JMP     FIDE0
1B64 CD5213     FIDENT: CALL    GETTY   ;TYPE TO H,L
1B67 E607               ANI     111B
1B69 3E55               MVI     A,'U'
1B6B CC1802             CZ      PERR
                ;
                FIDE0:
1B6E CD5813             CALL    GETVAL  ;VALUE TO H,L
                ;
                STNUM:  ;STORE H,L TO VALUE STACK
1B71 3A6C18             LDA     UNARY
1B74 B7                 ORA     A       ;UNARY OPERATION SET
1B75 CC851B             CZ      ERREX   ;OPERAND ENCOUNTERED WITH UNARY OFF
1B78 AF                 XRA     A
1B79 326C18             STA     UNARY   ;SET TO OFF
1B7C CD9318             CALL    STKV    ;STACK THE VALUE
                ;
1B7F CD0611     GETOP:  CALL    SCAN
1B82 C32A1A             JMP     OP0
                ;
                ERREX:  ;PUT 'E' ERROR IN OUTPUT BUFFER
1B85 E5                 PUSH    H
1B86 3E45               MVI     A,'E'
1B88 CD1802             CALL    PERR
1B8B E1                 POP     H
1B8C C9                 RET
                ;
1BA0 =          ENDMOD  EQU     ($ AND OFFE0H) + 20H    ;NEXT HALF PAGE
1B8D                    END
```

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0188 ACCLEN	0189 ACCUM	0040 ACMAX	19C2 ADD0	19BF ADDOP
19E0 ANDOP	18F4 APPLY	01D2 ASPC	15A6 BGET	15A0 BMOD
196D BNUM	15A3 BSEAR	1B1E CHKNOT	1A48 CHKVAL	000D CR
1B4A CURPC	1938 DIVE	1935 DIVF	1992 DIVOP	0002 DLABT
1946 DLOOP	1964 DSKIP	196B DTEMP	1A30 EMPOP	1A04 ENDEXP
1BA0 ENDMOD	1A01 ENDOP	134C ENTER	0004 EQUT	1B85 ERREX
01C9 EVALUE	0008 EXTT	1B6E FIDE0	1B64 FIDENT	1349 FOUND
01D0 FPC	1B7F GETOP	1352 GETTY	1358 GETVAL	000C GLBT
1877 HIERV	0001 IDEN	0200 IOMOD	18DE LODOK	18CF LODV1
18EC LODV2	1346 LOOKUP	000C LPAR	1AFC LPERR	0006 MACT
0006 MINUS	1999 MODOP	1973 MUL0	1982 MUL1	1983 MUL2
196E MULF	1989 MULOP	19D3 NEG0	192D NEGF	19D0 NEGOP
1AFF NLERR	0008 NOTF	19D9 NOTOP	0002 NUMB	0012 OBASE
1A2A OP0	1A5D OP1	1A85 OP2	1A89 OP3	1A94 OP4
1B26 OP5	1B31 OP6	1B50 OP7	1A19 OPAND	000F OPER
1AB5 OPER1	1AB9 OPER2	1ADE OPER3	1B03 OPER4	1B08 OPER5
1B0E OPER6	186D OPERV	1901 OPTAB	19EC OROP	000A OSMAX
1891 OSP	01CF PASS	0078 PBMAX	0184 PBP	010C PBUFF
0218 PERR	0001 PLABT	0005 PLUS	0011 PT	000B REFT
000D RPAR	0010 RT	1106 SCAN	1100 SCMOD	0005 SETT
134F SETTY	1355 SETVAL	1927 SHERR	191B SHFT	19A2 SHL0
199F SHLOP	19AE SHR0	19AB SHROP	0004 SPECL	18B0 STK0
18BF STK01	1893 STKV	18A2 STKV0	1B71 STNUM	0003 STRNG
19C6 SUBOP	01CD SYMAX	1340 SYMOD	01CB SYTOP	0185 TOKEN
186C UNARY	0186 VALUE	0010 VSMAX	1892 VSP	1881 VSTACK
0000 XBASE	19F8 XOROP			

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